

PB90-160219

Waste Reduction Assistance Program (WRAP) On-Site
Consultation Audit Report: Automotive Repair Shop

Alaska Health Project, Anchorage

Prepared for:

Environmental Protection Agency, Seattle, WA

22 Jul 87

U.S. Department of Commerce
National Technical Information Service

NTIS



Alaska Health Project

WASTE REDUCTION ASSISTANCE PROGRAM (WRAP)

ON-SITE CONSULTATION AUDIT REPORT:

AUTOMOTIVE REPAIR SHOP

ALASKA HEALTH PROJECT
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JULY 22, 1987

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161



REPORT DOCUMENTATION PAGE	1. REPORT NO. 002-004 A	2.	3. Recipient's Accession No. PB 90 160219 /AS
4. Title and Subtitle Waste Reduction Assistance Program (WRAP) On-Site Consultation Audit Report: Automotive Repair Shop		5. Report Date July 22, 1987	
7. Author(s)		6.	
9. Performing Organization Name and Address Alaska Health Project 431 W. Seventh Avenue Suite 101 Anchorage, AK 99501		8. Performing Organization Rept. No.	
12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency Region 10 1200 Sixth Avenue Seattle, Washington 98101		10. Project/Task/Work Unit No.	
15. Supplementary Notes This document is included in the Pollution Prevention Information Clearinghouse, operated by Science Applications International Corporation (SAIC) for the U.S.EPA, at 8400 Westpark Drive, McLean, Virginia 22102.		11. Contract(C) or Grant(G) No. (C) (G)	
16. Abstract (Limit: 200 words) This document reports on a study of an automotive repair shop and made specific recom- mendations for it to reduce hazardous waste. The report also made general recommendations to the automotive repair industry as a whole, including advice on choosing raw materials, segregation of used oils, inventory control, solvent recycling, etc.		13. Type of Report & Period Covered	
17. Document Analysis a. Descriptors pollution prevention, recycling		14.	
b. Identifiers/Open-Ended Terms			
c. COSATI Field/Group			
18. Availability Statement Release unlimited	19. Security Class (This Report)	21. No. of Pages 34	
	20. Security Class (This Page)	22. Price	

READERS NOTE:

The information contained herein is intended to be general guidance for the facility described in this report and the industry as a whole. It is the product of approximately 6 to 8 hours of on-site consultation. The focus of the report is waste management and waste reduction, not regulatory compliance. Regulatory issues mentioned herein are discussed only insofar as they impinge on management issues related to hazardous waste management and waste reduction, and are not part of a comprehensive discussion about all pertinent regulation requirements. Waste determinations were made from available data, no on-site sampling took place. Managers interested in specific information on hazardous waste regulations should contact the nearest EPA or Department of Environmental Conservation office. Waste reduction measures are described briefly and should be further evaluated and balanced against unique conditions of each specific business.

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I. INTRODUCTION

A. The Waste Reduction Assistance Program (WRAP).

In 1986, the United States Environmental Protection Agency (US EPA) awarded a RCRA 8001 grant to the Alaska Health Project, a private non-profit organization located in Anchorage, Alaska. The grant was awarded to develop and deliver a pilot project to assist Alaska's Small Quantity Generators (SQGs) in complying with new Small Quantity Generator regulations. The project, the Waste Reduction Assistance Program (WRAP) has two principal goals:

1. To conduct outreach and education activities to support EPA's Small Business Initiative to achieve SQG compliance with new hazardous waste regulations.
2. To conduct on-site audits to investigate hazardous waste management practices and processes for specific SQG categories.

WRAP on-site consultation audits are conducted with the understanding that the identity of selected SQGs remain confidential and that all audit reports contain no specific facility identifiers. Audit results and recommendations are intended to be widely applicable to other SQGs in Alaska. Audit reports are available to interested parties upon request.

This report is the product of conducting an environmental audit of an Alaskan automotive repair shop. The report goals are to:

1. Analyze a typical automotive repair shop in Alaska and publish the findings in a report.
2. Provide a format, by making this report available, to other repair shops and businesses to conduct their own environmental audit.
3. Identify hazardous wastes produced in the automotive industry and the processes by which they are generated.
4. Make recommendations, where appropriate, to reduce the amount of hazardous waste generated.
5. Identify common waste management practices and advise on possible better methods to store, ship and otherwise handle hazardous wastes.
6. Analyze the costs and benefits of the waste reduction methods recommended in this report.

All recommendations, information, and cost data are subject to change. They will not reflect future market conditions, regulatory climate, and changes in plant processes. This report

offers only general guidance to other Small Quantity Generators and all the information provided should be balanced against the unique conditions of each specific business.

B. Audit Methods

The on-site audit team consisted of an environmental scientist and an environmental health specialist. Additional assistance was provided by a civil engineer, and an certified public accountant. The audit comprised two main steps:

1. Interview and data collection
2. Plant walkthrough

Step One consisted of an interview with the plant manager. The interview was designed to collect the following information:

1. General plant information (size, operation, etc.)
2. Plant processes/waste characterization
3. Material Safety Data Sheets
4. Current waste management/waste reduction practices

Step One was also designed to provide the plant manager with a detailed description of the audit process.

In Step Two, the on-site audit team and the plant manager conducted a visual inspection of the plant operations and processes. The audit team identified the processes generating potential hazardous wastes and investigated current waste management practices.

The approximately 6 hours of on-site consultation included no environmental sampling or industrial hygiene monitoring. All information provided in this report is based upon the interview, walkthrough, and a review of the current and available literature. Hazardous waste determinations were based upon a review of material safety data sheets, any existing laboratory reports, any waste manifests, and EPA literature. Waste volume figures are based upon estimates made by the generator and the audit team during the plant walkthrough.

II. Automotive Repair Processes Description

The Automotive Repair shop described in this report is an independent business which has been in operation for approximately three years. The plant is located in an area zoned for industrial/business use. The surface area of the shop is 48,000 square feet. In addition to the plant manager and office manager, the shop employs eight certified automobile mechanics.

The plant is a full service facility that can perform repair work from the "front of a vehicle to the rear bumper". It services all types of cars and light to medium duty trucks. Processes performed by the repair shop can be grouped into the following broad categories:

- a. Axle overhauls
- b. Brake jobs
- c. Computer diagnostic tests
- d. Electrical repair
- e. Emissions testing/exhaust work
- f. Engine overhaul
- g. Mechanical related work
- h. Suspension/drive train repair
- i. Tune-ups
- j. Transmission work

The above processes are widely used in the automotive repair industry in Alaska.

In general, the flow of work in this automotive shop begins in the front office area. A customer enters the shop and requests specific repairs on his vehicle. The job is then "written up" and a mechanic is assigned to perform the repair work. Each mechanic is assigned a work area or "stall" to complete the repair noted on the work order.

Specific tasks involved during the performance of the various work operations described above can include:

A. Parts Disassembly and Reassembly

This process generally involves physical rather than chemical activity. Mechanics will disassemble, inspect and then reassemble various vehicle components. Aerosol cleaning solvents

and lubricants are used during this process.

B. Parts Cleaning

Most auto repair work involves some type of degreasing process or parts cleaning. In general, degreasing is the removal of surface grime, oil, and grease from the metal auto part that needs inspection and repair. Common forms of parts cleaning include cold degreasing, and vapor phase (hot) degreasing.

The auto repair shop described in this audit employs several parts cleaning processes. Typically, more than one process is used to clean a single part. The various cleaning processes are described below.

1. Aerosol Spray Cleaning:

Twelve to sixteen ounce aerosol spray cleaners are used to clean and lubricate small engine parts. These cleaners are hand-held by the mechanics and sprayed directly on the part to be inspected and repaired. This process is typically used during vehicle tune-up operations and brake jobs.

Aerosol spray cleaners are also used to eliminate the residual solvent and grime remaining on parts cleaned in the cold degreasing tank (described below).

2. Cold Degreasing Tank:

This type of cleaning process is commonly used in small shops and garages. The process is used for major vehicle repair work such as engine overhauls, transmission repair, and work performed on vehicle suspension and the drive train.

Briefly, the process involves placing the vehicle part into the degreasing tank. The part is cleaned through a soaking process. Shop mechanics will also physically brush the part to enhance the cleaning process.

Cleaning solvents used during this process will vary. Stoddard solvent is commonly used. The auto repair shop described in this audit has switched from a Stoddard solvent cleaning bath to a diesel/kerosene cleaning mixture primarily to eliminate the Stoddard solvent waste stream.

3. High Pressure Water Washer

The auto repair shop also uses a high pressure water washer to clean engine parts. The totally enclosed system operates at 400 psi and uses water/soap mixture, heated to 140-160 F., to clean the parts. The water/soap mixture is contained in a 5 gallon container and is passed through the system at a rate of 2-gallons per minute and is recycled through the system. To facilitate the cleaning process parts are first soaked in the

cold degreasing tank to loosen up grime and grease on the engine part. The cleaning process takes approximately 5 to 10 minutes.

4. Carburetor Cleaning Drum:

A 5-gallon cleaning tank (drum) is used to clean carburetors in the shop. The cleaning solvent used is methylene chloride, a chlorinated solvent. The solvent cleaning drum is water sealed to prevent excessive evaporation of the solvent.

The process involves placing the part into a wire mesh basket which is then placed into the drum. The part is allowed to sit in the drum for 30 minutes to 24 hours depending on how busy the shop is. Once cleaned, the basket with part is hung on the lip of the drum suspended above the cleaning solvent for approximately 10 minutes allowing residual solvent to drip back into the drum. The part is then washed with a water wash from a hose to rinse off residual solvent and blown dry making the part ready for use. The water wash is squeegeed into a nearby drain connected to an oil/water separator.

C. Oil/Fluids Change:

Tune-ups and other forms of automobile repair work involve replenishing and replacing oils, lubricants and other fluids needed to maintain the operating efficiency of the vehicle. The process involves draining the fluid from the fluid reservoir on the automobile into a collection container.

The shop in this audit identifies the type of oil/fluid being handled according to the fuel used by the vehicle, such as unleaded, or leaded gasoline. Once the oils or fluids are collected, mechanics will transfer the oil (by funnel) according to suspected type into one of three larger storage containers marked leaded oils (55-gallon drum), hazardous waste oil (55-gallon drum), non-hazardous waste oil, (or on-spec used oil, 500 gallon underground storage tank).

Customers can also provide the shop with their own waste oil container and accept responsibility for oil disposal.

Raw Process Materials:

The raw materials used by the automobile repair shop described in this report include:

1. Oils, lubricants, and other fluids: Approximately 2000 gallons are put into vehicles in any given year at the cost of approximately \$6500/year.

2. Kerosene/diesel: 30 gallons of each material are used during

waste kerosene/diesel "solvent" mixture per year (or 6 to 8 gallons per cleaning). Additional solvent is lost through evaporation, absorption onto rags and operator clothing, mixed with sludge, drag-out, and miscellaneous spills.

c. Carburetor Cleaning Drum

The carburetor cleaning process generates about 10 gallons of waste per year, most of which is lost through evaporation into the shop environment. The waste contains primarily methylene chloride in addition to xylene and cresylic acid.

This process also generates approximately 40 gallons of wastewater per month. Wastewater is generated when residual solvent is washed off carburetors , the final step in the cleaning process.

d. Pressure Washer:

Approximately 4 gallons of wastewater are generated by this process per cleaning. It is cleaned approximately 4 times per month depending on the volume of work. Approximately 16 gallons of wastewater are generated each month.

2. Oil/Fluids Changes

Listed below are estimated waste volumes generated through the replacement of vehicle oils and fluids:

- a. "Suspected " off-spec used oil (leaded oil) is generated at the rate of 55 gallons per year (4.5 gallons per month). The source of leaded oils are leaded gasoline vehicles serviced in the shop.
- b. Hazardous waste contaminated oil is generated at a rate of 18.3 gallons per year (1.5 gallons per month). The sources of contamination include cold tank wastes, any waste carburetor cleaner and other cleaning solvents. Volume varies depending on the contamination of on-spec oil (issue discussed later in this report).
- c. On-spec used oil (non-hazardous waste oil) is generated at a rate of 500 gallons per year (41.6 gallons per month). The sources of non-hazardous waste oil include oils for vehicles using unleaded fuels, transmission fluids, axle lubricants, transfer case lubricants.
- d. Anti-freeze (ethylene glycol) is generated at a rate of 220-330 gallons per year (27.5 gallons per month).

3. Other Waste Sources

Other waste sources generated by the automobile repair shop include the following:

- a. According to the plant manager, approximately 10 gallons of "sludge" material is generated every three years when the oil/water separator screen connected to the floor drain is cleaned.
- b. The plant manager estimates that the shop recycles approximately twenty to thirty 12 volt batteries per year.
- c. Total plant wastewater volumes were not available at the time of the audit.

TABLE III. 1

WASTE GENERATION BY PROCESS

PROCESS	WASTE TYPE	QUANTITY
Aerosol Sprays (Chem tool, Brake Klean)	petroleum distillates toluene, alcohols chlorinated solvents	approx. 40 gal. lost by evaporation/ year
Cold Degreasing Tank (soak tank)	diesel, kerosene heavy metal sludge	12-16 gal./ year
Cold Degreasing Tank Sludge	diesel, kerosene heavy metal sludge	4 gal./year
Carburetor Cleaning	methylene chloride, xylene, cresylic acid	10 gal./yr. lost by evap oration.
Pressure Washing	biodegradable soap, water	16 gals./ month
Changing oil	off-spec used oil (leaded vehicles)	4.5 gal./ month
	hazardous waste oil (sludges, solvents, heavy metals)	1.5 gal./ month
	on-spec used oil transfer case oil, lubricants, etc.	41.6 gal./ month
Antifreeze	ethylene glycol	27.5 gal./ month
Washwater (from carburetor cleaning process and pressure washer)	water (with possible solvent, heavy metal contamination)	56 gal./ month
Sludge from oil/water separator	unknown, possibly heavy metals, solvents, soaps, etc.	10 gal./ every 3 years.

B. Regulated Wastes

Table III.2 provides a general regulatory classification of wastes produced by the automotive repair shop. Note that the properties of the wastes listed in this report were established using information from available material safety data sheets, EPA literature, and the shop manager. Consult Appendix C for a description of wastes produced by the automotive industry. No actual waste stream sampling was conducted. Given these conditions, much of the waste generated by the automotive shop does not appear to be regulated under the Resource Conservation Recovery Act (RCRA) as amended.

On-spec used oil and off-spec used oil is collected for reprocessing or boiler feedstock and is not regulated as a hazardous waste. Regulations pertaining to this type of waste (found in 40 CFR Parts 260, 261, 264, 265, 266, 270, 271, and 302) place restrictions on the methods by which it can be recycled and burned. It should be noted that used oil mixed with a listed hazardous waste is fully regulated as a hazardous waste.

TABLE III.2
Classification of Automobile Repair Shop Wastes

Waste Type	Chemical Name	EPA Haz./Waste #
Aerosol Sprays	petroleum distillates, alcohol, chlorinated solvents	D001
Diesel/Kerosene	diesel/kerosene possibly with heavy metals	D001
Carburetor Cleaner	methylene chloride xylene, cresylic acid	F001
Lead/acid Batteries	lead, acid	lead-dross 3 percent, D008, can be recycled
Antifreeze	ethylene glycol	wasteliquid, NOS. see MOA sewer Ordinance 26.50
Washwater	soap, water, unknowns, should be tested.	same as antifreeze
On-spec used oil	oil, heavy metals, halogens within specification, not contaminated with RCRA waste.	waste petroleum oil. Not RCRA regulated. Recycle.
Off-spec used oil	oil, heavy metals, halogens exceeding specification, not contaminated with RCRA waste.	RCRA regulated, Part 266, sub- part E.
Sludge (oil/water separator)	oil, heavy metals, halogens.	unknown determination, should be tested.

IV. WASTE MANAGEMENT

A. Waste Storage

A Small Quantity Generator (SQG) may not store hazardous wastes in quantities greater than 13,200 pounds (6000kgs) for longer than 180 days. In Alaska, because there are no treatment, storage, or disposal facilities within 200 miles, small quantity generators can store wastes for up to 270 days. Generators of less than 220 pounds per month of hazardous wastes are subject to SQG regulations if they store more than 2,200 pounds of hazardous wastes. However, they must still identify their hazardous wastes and send their wastes to a hazardous waste management facility.

Hazardous waste containers must be clearly labeled "hazardous wastes". The containers must also be marked with the date the collection of hazardous wastes began. The regulations specify that the containers should be kept in good condition (no leaks, corrosion, or ruptures). Waste containers must also be closed, and inspected. Ignitable and reactive wastes should be stored as far as possible from the generator's property line. Waste may be treated on-site without a permit provided that :

- a. They are treated within 180 days. In Alaska, 270 days.
- b. The containers conform to the regulations described in the above paragraph.
- c. Steps are taken to prepare for and prevent accidents as described in the Small Quantity Generator regulations.

Briefly, SQG regulations require that generators take precautions to prevent accidents involving hazardous wastes stored or otherwise handled on site. The regulations for the storage of hazardous wastes were written to prevent accidental spills, fires, and release into the environment. The regulations also require that facilities have emergency communication equipment and fire suppression devices (specific to the waste handled) to respond to emergencies. Finally, the regulations require that emergency response procedures are established with the local fire department and other emergency agencies that might respond to an emergency at the facility. It is also recommended that a generator develop a contingency plan to address accidents involving hazardous wastes stored at the facility.

The generator described in this report understands the need for and the benefits of properly storing hazardous wastes. Wastes which are stored on-site are segregated according to waste type. For example, off-spec used oils, hazardous waste oils, and on-spec used oils are all stored in separate storage containers. This is an effective waste reduction method and helps the shop

manager get a clearer understanding of his potential hazardous waste streams

The shop manager also emphasizes employee training in the area of hazardous materials storage. Employees are familiar with the wastes produced in the shop and understand the importance of segregating the various waste oils produced in the shop.

Currently, the shop has no formal preparedness and prevention plan, nor does it have any set program for hazardous waste container inspection. Drums in storage are not dated.

Storage of wastes occurs within the shop. This concerns the generator, but few alternatives are available. The current lease agreement for the facility prohibits storage of shop materials of any kind outside of the building proper.

B. Waste Disposal Methods

Antifreeze / Washwater

Antifreeze and other waste washwater are disposed into the sewer system. These wastes are not regulated hazardous wastes and can be disposed of in this fashion provided they satisfy the limitations set forth by state regulations and municipal sewer ordinance (see Appendix D).

Certainly the contaminants in these waste streams can vary and it would be important to keep track of these waste streams from a compliance perspective. Washwater and/or antifreeze suspected of containing listed hazardous wastes or exhibiting hazardous waste characteristics should be analyzed and the generator should contact the sewage treatment facility for disposal approval.

Batteries

The batteries generated by the shop are offered to a local battery recycler for reconditioning and are therefore not regulated as hazardous wastes.

Waste Oils

Off-spec used oil and on-spec used oil are "disposed" through contract with the licensed transporter and are refined, reprocessed, or offered to facilities approved to burn this type of waste. The generator described in this report also provides customers with reduced rates on oil changes if the customer retains the waste oil. Many customers opt for this choice and provide the shop with a "waste oil collection jug" (typically a milk jug, or the like).

Customers are then responsible for disposing of the oil. The plant manager provides customers with information about how they can dispose of their waste oil at the city sponsored waste oil collection facility.

Recycling waste oil as an energy source is approved by the Alaska Department of Environmental Conservation and the EPA, under certain circumstances, specifically the types and level of contamination in the oil and the type of combustion chamber used to burn the oil. Waste oil is considered "clean" (on-spec) and may be used in non-industrial boilers provided that the oil does not exceed the following conditions set forth by DEC.

- a. A flash point below 100 degrees Fahrenheit
- b. Arsenic levels above 5 part per million (ppm)
- c. Cadmium levels above 2 ppm
- d. Chromium levels above 10 ppm
- e. Lead levels above 100 ppm
- f. Halogen levels greater than 1,000 ppm.

Waste oil containing higher concentrations of these constituents are subject to greater restrictions and may only be burned in certain types of facilities for certain purposes (see Appendix E for a more complete discussion).

Any listed hazardous waste that is mixed into used oil renders the entire batch hazardous waste and must be disposed of at a hazardous waste facility.

Contaminated Clean Oil

Contamination of on-spec used oil stored in the 500 gallon tank continues to plague this shop. The shop manager has drained the tank and steamed cleaned it, but the waste oil typically exceeds the halogen standards when tested (colormetric test) by the hauler. A more complete lab analysis was performed indicating a halogen content of 1460 parts per million (ppm). The resulting effect is increased disposal costs for the generator. In addition, the contamination of "clean" used oil changes his generator classification from conditionally exempt to the small quantity generator category (producing greater than 220 pounds per month).

The audit uncovered some potential sources (or combination of sources) for contamination of the on-spec oil.

1. While waste oil is segregated in the shop according to type and "hazardousness", one funnel is used to transfer all oils into their specific storage containers. This raises the possibility that contaminated waste oil is transferred to the on-spec oil

tank via the funnel.

2. The waterwash step in the carburetor cleaning process may literally wash halogenated solvent containing wastewater into the on-spec used oil tank. This tank is located underground and has a drain opening at floor level. The cap for the drain does not fit the opening raising the potential for contamination of on-spec used oil.

3. The carburetor cleaning drum (and all the other waste oil drums) is located a few feet from drain for the on-spec oil tank. The audit interview revealed that most of the 10 gallons of carburetor cleaner is lost through evaporation. The on-spec oil could be contaminated through the evaporation of the methylene chloride. Methylene Chloride has a vapor density (1.78) greater than air(1), therefore the vapors will tend to stay at floor level.

C. Disposal Costs

The costs for disposing of hazardous wastes can vary. Some factors influencing disposal costs include:

1. The quantity and the nature of the waste
2. Transportation distance
3. Fluctuations in the prices set by disposal facilities and haulers for handling hazardous wastes.

It may be advantageous for automobile repair shops to contact other similar shops to coordinate disposal activities and realize savings through bulk shipments. Waste determination fees may be eliminated if future waste streams remain constant.

In Alaska, there are no approved commercial hazardous waste disposal facilities. All hazardous wastes, as defined by RCRA, must be shipped out of state to an approved facility. The automobile repair shop in this report contracts with a local waste oil hauler which in turn transports the used oil to appropriate facilities meeting the requirements to recycle or reprocess this material.

According to the shop manager, the costs for disposal waste oil range from \$.50/gallon to \$7.00 per gallon, depending upon the level of hazardous constituents in the oil. This particular shop generally pays \$1.50/gallon to dispose of contaminated on-spec used oil waste oil in addition to a \$175 lab fee for waste oil testing. Currently it costs the shop approximately \$925/year to dispose of its clean waste oil (500 gals. x \$1.50 + \$175.00 = \$925). The other oils (off-spec and hazardous waste oil) have not yet been disposed nor tested and therefore disposal figures are not available.

V. WASTE REDUCTION ALTERNATIVES

A. Incentives

A number of incentives exist to promote hazardous waste reduction in the Alaska private sector. Some incentives include:

1. **High Disposal Costs:** Land disposal restrictions outlined in the Hazardous and Solid Waste Amendments of 1984 limit the number of untreated wastes that can be disposed of in landfills, and impose greater restrictions on surface impoundments and underground tanks. Hazardous waste management facilities are scarce in the United States; no such facility exists in Alaska. Complete disposal costs for one 55-gallon drum cost up to several hundred dollars per drum. Transportation costs alone are about 350 dollars per 55 gallon drum.

2. **Raw Materials/Cost Savings:** A number of documented cases throughout the United States indicate that real savings can be actualized by employing waste reduction methods.

3. **Financial Liability:** Generators of hazardous wastes incur liability for their wastes from the time they are produced and even after they have been disposed. The liability includes potential improper handling by the waste transporter and the disposal facility. Generators are also liable for any future sudden releases of disposed wastes. The generator may be required to pay for the entire cleanup of a spill or other type of release. Generating a smaller amount of waste will reduce liabilities in this area.

4. **Public Relations:** Employing waste reduction techniques in a business can improve the public perception of the business. A favorable perception can result in better community relations and possible financial gains.

B. Waste Reduction Categories

Waste reduction techniques can be grouped into the following broad categories.

1. **Process Technologies:** This involves changing shop processes to reduce wastes. For example, replace a degreasing tank with a high pressure washer to eliminate solvent wastes.

2. **Plant Operations:** This category involves alterations in plant operations to decrease the generation of hazardous wastes. For example, improved inventory control, worker education, improved housekeeping are examples of plant operation changes that can be employed to help reduce hazardous waste and improve waste management in the shop.

3. **Plant Input Changes:** Another way to reduce hazardous waste generation is to utilize raw materials that will not become

hazardous wastes during the production process. For example, using non-toxic cleaners instead of solvents to clean certain engine parts, etc.

4. In-Process Recycling: This process reduces hazardous wastes by recycling raw material back into the production process.

C. Current Waste Reduction Practices In The Shop

The shop in this audit has made some effort to improve waste management practices and develop waste reduction programs, particularly in the area of plant operation changes. Following is a summary of these changes:

a. Improved management philosophy: The shop manager has followed recent developments in hazardous waste regulations. In the interview he stated a change in his own attitude toward hazardous wastes. He now emphasizes waste reduction and attempts to communicate this information to his employees. This change in attitude is an important first step for all businesses interested in waste reduction.

b. Waste segregation: Waste oil is segregated in the shop according to type and potential hazardous constituents. This procedure helps the shop manager identify his potential waste streams and avoid unnecessary production of hazardous wastes.

c. Employee training: The shop manager has communicated with shop employees about the need for waste segregation and waste reduction in the shop. The shop manager understands the important role workers play in the area of waste reduction.

d. Pre-soak cleaning procedures: Heavily soiled parts are pre-soaked in the cold tank to remove large particulate matter and loosen dirt and grime prior to being cleaned in the pressure washer. This procedure extends the life of the pressure washer soap solution and presumably prevents gross contamination of pressure washer wastewater.

Of note: repair shops can also use old solvent solutions to pre-soak parts prior to placing the parts into the fresh solvent solution. This procedure will extend the life of the fresh solvent bath, reduce waste volume, and raw material costs.

D. Other Waste Reduction Opportunities For This Shop And the Automotive Repair Industry

Plant Process Technologies

a. Micron filtering system: Diesel/kerosene mixtures in the degreasing tank can be reused with the addition of a micron filtering System. Briefly, this system is designed to separate liquid fractions of the mixture from the solid particulate matter, thus allowing continued reuse of the diesel and kerosene and the realization of savings in raw material costs. According to the audit interview this system can be purchased for approximately \$300.

The shop currently spends \$75.00 per year to purchase 30 gals. of diesel and kerosene. The degreasing tank generates approximately 20 gallons of waste per year (approximately 20% is sludge material). This process experiences a 30 per cent loss in raw materials. Losses occur due to evaporation, drag-out, and absorption into sludge materials. It is assumed that the sludge waste will be generated at the same rate with the micron filter and that waste disposal costs will be \$1.50/gallon. Given these parameters the payback period will be about 4 years.

Repair shops using strictly solvents in their degreasing tanks also have options for recycling solvents. Solvent recycling is feasible, and can be achieved through the purchase of a solvent still for about \$5000.00. The still separates solvents from particulate matter, allowing the suspended materials to settle out prior to decanting the liquid.

The amount of time required to pay off the system through the recovery of solvent depends on a variety of factors including the value and the quantity of the solvent recovered, and the disposal and transportation costs. Based on raw material and disposal costs alone the payback period is roughly 5 years. (This assumes that 100 gallons of halogenated solvent @ \$2.20/gal. is used per year and that disposal costs are \$7.00/gal.) These figures do not factor materials losses due to evaporation, drag-out, etc. which will extend the payback period.

b. Pressure washer: The automobile repair shop described in this report is currently "experimenting" with a high pressure washer to replace the cold degreasing tank. This process technology change is worthy of investigation for all repair shops and other businesses using cold tanks.

By design, the pressure washer does not use chemical materials. Cleansing occurs through the use of hot pressurized water and a biodegradable soap. Thus, a pressure washer can eliminate the need to purchase raw materials such as solvents (or kerosene/diesel) and the resulting disposal costs.

As previously discussed, the shop described in this audit

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first pre-soaks machine parts in the cold tank prior to placing them in the pressure washer. Pre-soaking occurs because this particular pressure washer does not effectively clean parts heavily soiled with grit and grime.

According to the interview the current pressure washer used by the shop costs about \$2,800 and requires approximately 50 pounds of soap per year of operation. The soap costs approximately \$2.00 per pound which translates into an expenditure of \$100 per year on soap.

The shop manager also stated that a custom pressure washer could be built with an improved design for as little as \$1500. Design improvement includes increasing the water pressure, temperature, etc. This improved design will reduce the need to pre-soak engine parts, according to the interview.

A more expensive pressure washer (approximately \$10,000) can be purchased to completely eliminate the need to pre-soak parts in the cold tank (presumably eliminating the need for a cold tank). This machine washes and steam cleans machine parts.

Businesses should consider using pressure washers with detergent-based cleaning solutions where applicable. This will reduce reliance on chemical solvents and eliminate worker exposure to solvents and other cleaning chemicals. Furthermore, the fire hazards associated with some solvents and with diesel and kerosene will be eliminated.

Pressure Washer Reduces Aerosols

Currently, workers use these spray cleaners to loosen excess diesel/kerosene film and grime left on engine parts when removed from the degreasing tank. The shop manager estimates that 25 per cent of the aerosol sprays are used for this purpose. Purchase of detergent based cleaners and/or pressure washers will help eliminate the need for these spray solvents.

The elimination of 25 per cent of the aerosols will save the business money and reduce the amount of airborne pollution in the shop. Moreover, reduced use of aerosols, elimination of solvents, diesel and kerosene will reduce potential exposures in the workplace protecting the health and safety of workers and management.

c. **Recycle used oil:** Recycling waste used oil as an energy/heating source may be an option this automobile repair shop and other repair shops in Alaska. It will help reduce disposal liabilities and reduce heating costs.

A fully automatic multi-oil furnace on the market today is manufactured by Black Gold Inc. of Ogdensburg, WI. Product literature indicates that it meets EPA and NFPA standards and that burning 500 gallons of used oil per year can realize a ten

year saving of \$10,000 when compared to fuel oil and natural gas.

The device can be used as an area heater or joined to existing duct systems in many different types of facilities including service stations, repair garages, aircraft hangers, etc. See Appendix E for additional cost and payback information. (Of note, mention of this product is not an endorsement.)

Plant Operation Changes

a. Used oil segregation changes: Use separate funnels to transfer waste oil. Cross contamination of segregated waste oil containers may be occurring as a result of using one common funnel for all the waste oil containers. Use of separate funnels may decrease the halogen levels appearing in the clean waste oil tank.

b. Carburetor cleaning changes: Rigid work practice controls should be instituted during the carburetor cleaning process to prevent contamination used oil in underground storage tank. (See IV. Waste Management for more discussion on this topic.)

c. Underground used oil storage: Purchase cap which properly fits over the drain opening to underground waste oil tank. This will prevent any accidental contamination of the waste oil.

d. Maintain degreasing operations: Clean out degreasing tank sludges frequently. This will save on raw materials by reducing solvent absorption into sludge materials.

e. Prevent solvent loss: Control against drag-out of solvents from degreasing tank. Be certain that residual solvent drains back into tank.

Plant Input Changes

Detergent-based cleaners: Use of detergent-based cleaning baths will promote elimination of solvent (or diesel/kerosene)baths. Detergent cleaners worked well on aluminum-based automobile parts. These cleaning solutions can be replenished by the addition of fresh detergent extending the use of the initial solution. This results in raw materials savings and reductions in hazardous waste generation. In addition, use of detergent cleaners will eliminate worker exposure to diesel and kerosene, both of which are potential carcinogens.

VI. SUMMARY AND CONCLUSIONS

The Automobile Repair facility described in this audit is clearly aware of the need to reduce wastes from both an economic and a public health perspective. The audit results indicate that the facility's generator status fluctuates between "conditionally exempt" and "small quantity generator." The status is largely dependent the amount and the contamination of used oil generated by the facility. Used oil is the primary waste type generated from the facility. Several options exist to improve waste management and promote waste reduction in the shop.

In general, the repair shop should continue to carefully monitor the various raw materials and shop processes to develop precise data on waste volumes, types, and waste management practices. It is strongly recommended that the generator test each waste stream (at least once) to determine their exact constituent contents.

Furthermore, the shop should develop a more formal hazard communication program in order to maintain current information on raw chemical materials used in the shop. This will help workers to become better educated about the health and safety aspects of materials used in the shop. In addition, shop management will be better able to predetermine potential waste stream constituents by reviewing material safety data sheets.

Tighter housekeeping controls should also be instituted to prevent contamination of the on-spec used oil stored in the underground storage tank. These controls included but are not limited to:

1. Obtaining secure fitting cap for underground tank drain.
2. Emphasizing workplace practices that prevent spills and raw materials losses. For example, product lids should be tight fitting and in place when the product is not being used to prevent evaporation, particularly the carburetor cleaner.
3. Using water sparingly when washing off parts from carburetor cleaner. Prevent wastewater from entering the underground storage tank drain.
4. Using separate funnels when segregating used oils to prevent cross contamination.

Finally, expanded use of pressure washer systems and detergent-based cleaning solutions are recommended in order to reduce reliance on solvents and aerosol cleaners.

It should be restated that the hazardous wastes and other wastes generated by this shop were determined with information provided by the shop manager at the time of the audit. The auto repair shop may be generating additional wastes if chemicals and

processes, other than those described in this audit, are used. Seasonal work order fluctuations will also affect the volume of wastes produced and possibly the generator status of the facility.

The following are additional waste reduction/waste management options recommended for this shop and the general automotive repair industry.

GENERAL WASTE MANAGEMENT/REDUCTION RECOMMENDATIONS

1. Choose raw materials not solely in terms of performance but also in terms of their hazardous properties as wastes. For example, investigate the potential for substituting detergent-based cleaners for solvent cleaners (or diesel/kerosene as is the case in the shop described in this audit.)
2. Continue to segregate used oils in order to minimize cross contamination of waste oil streams and to identify average waste stream volumes.
3. Continue and expand efforts to educate workers and management in the pertinent aspects of hazardous waste regulations, storage requirements, and waste reduction. Combine these efforts with implementation of a " worker right to know" program.
4. Rigid inventory control should be implemented as much as possible to reduce the amount of raw material used. Better inventory control can be implemented through revised purchase order policies and worker training and education.
5. Emphasize good housekeeping practices to prevent unnecessary raw material losses and waste spills.
6. Repair shops which continue to use solvent degreasing units should invest in solvent recycling units to save raws materials and reduce waste volumes and disposal costs. They should also consider using detergent-based cleaners and pressure washers to eliminate chemical cleaners where applicable.
7. Clearly label and date waste drums. Inspect storage area weekly.
8. Clean out degreasing tank sludges frequently to maintain the quality of fresh raw cleaning material.
9. Explore the applicability of used oil furnaces to recycle on-spec used oils.
10. Where applicable, pre-soak engine parts in old cleaning solvents to extend the life of the fresh solvent material.
11. Test all waste streams (at least once) to determine the exact constituent contents of the waste streams produced.

12. Conduct periodic waste audits to monitor waste streams and waste management practices in the shop.

Appendix A

Synopsis of the Small Quantity Generators Regulations

Facilities producing between 220 and 2200 pounds of hazardous wastes per month are subject to the Small Quantity Generator regulations. These regulations will require waste producing facility to:

- 1) Identify the hazardous wastes produced.
- 2) Obtain an EPA identification number.
- 3) Ship hazardous wastes for treatment, storage, or disposal in EPA approved facilities. The shipment will have to meet the requirements set by the Federal Department of Transportation for hazardous wastes. In addition the shipment will have to be accompanied by a manifest containing the generator's name and address, the shippers name, and the name and address of the receiving facility.
- 4) The hazardous wastes should be offered, at least every 180 days, to shippers and disposal facilities with an EPA identification number. In Alaska, because there are no EPA certified hazardous waste disposal sites within 200 miles, the wastes can be stored for 270 days. The maximum weight of the wastes being stored, however, cannot exceed 13,200 pounds.
- 5) Finally, the waste generator should keep a copy of the shipping manifest for three years.

A P P E N D I X B



U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

OCT 03 1986

RECEIVED
OCT 09 1986

REPLY TO
ATTN OF M/S 530

WASTE MANAGEMENT BRANCH

David Wigglesworth
Alaska Health Project
417 W Eighth Avenue
Anchorage, Alaska 99501

David
Dear Mr. Wigglesworth:

This is in reply to your question regarding information required by the Alaska Health Project's small quantity generator study. The purpose of this project is to study general waste management procedures and processes for specific small quantity generator categories. We hope to identify common current waste practices that can be better managed, and/or methods where waste generation can be minimized.

Because we wish the study results and recommendations to be as widely applicable to other generators as possible, we would like to obtain information which characterizes the representative generators you are studying. We do not feel any facility-specific identifiers will be necessary, but we would like any information on the facility type, process, size of operation, and/or any other information which would have bearing on the usefulness or extrapolation of the data to other generators, both in and outside of Alaska.

If you have further questions, please feel free to contact me.

Sincerely,

Joan
Joan Cabreza
RCRA Program Development

APPENDIX C

Vehicle Maintenance

IF YOU REPAIR OR MAINTAIN

- | | |
|-------------------|-------------------------------|
| ► cars | or if you |
| ► vans | ► remove oil or grease |
| ► trucks | ► remove rust, dirt or paint |
| ► heavy equipment | ► repair or rebuild |
| ► farm equipment | ► refinish or restore |
| ► planes | ► paint |
| ► boats | ► replace lead-acid batteries |

the products you use on the vehicles, and on your equipment, tools, hands, or floor may contain hazardous materials, and the wastes generated by using these products may be hazardous wastes.

PRODUCTS CONTAINING HAZARDOUS MATERIALS

Everyday mechanics, bodymen and others use products containing hazardous materials. Products like:

- Rust removers, which contain strong acid or alkaline solutions

- Carburetor cleaners, which contain flammable or combustible liquids
- Used rags containing combustible or flammable solvents
- Paints with flammable or combustible thinners or reducers
- Auto and truck batteries

contain chemicals or materials which are hazardous to human health and the environment. Table 1 lists typical operations/processes which use products that may contain hazardous materials and which probably generate hazardous wastes. If you generate 220 pounds (about half of a 55-gallon drum) or more of hazardous waste per month, you must fill out a Uniform Hazardous Waste Manifest when you ship this waste off your property.

UNIFORM HAZARDOUS WASTE MANIFEST

Item 11 of the Uniform Hazardous Waste Manifest requires the proper Department of Transportation (DOT) shipping description, which includes:

► the proper DOT shipping name for each waste. To help you complete this item, Table 2 provides this information for some of the hazardous wastes you are most likely to generate. To obtain the DOT shipping name, hazard class and UN/NA identification number: Select the typical process/operation from column 1 of Table 1. Match the ingredients from column 3 and the waste type generated from column 4 of Table 1 with the waste type and ingredient in column 1 of Table 2.

Not all vehicle maintenance operations generate hazardous wastes. If you don't see a particular chemical that you use, or if you generate a waste not listed, or if you need any type of help, call your state hazardous waste management agency.

NOTE: Under current federal law, you do not have to use a Manifest when you ship:

► used/dead lead acid batteries that are destined for recycling

► used motor oil. Be aware, however, that the regulations for used oil may change. You should still use environmentally sound methods for the collection, storage and recycling of used motor oil.

Remember—your state may have its own requirements for lead acid batteries or used oil. Be sure to check with your state hazardous waste management agency.

Table 1 TYPICAL OPERATIONS USING MATERIALS WHICH MAY GENERATE HAZARDOUS WASTES			
TYPICAL PROCESS/OPERATION	TYPICAL MATERIALS USED	TYPICAL MATERIAL INGREDIENTS ON LABEL	GENERAL TYPES OF WASTES GENERATED
Oil and grease removal	degreaser—(grease), carburetor cleaners, engine cleaners, varnish, solvents, acids/alkalis	petroleum distillates, aromatic hydrocarbons, mineral spirits	ignitable wastes, spent solvents, combustible solids, waste acid/alkaline solutions
Engines, parts and equipment cleaning	degreaser—(grease), carburetor cleaners, engine cleaners, solvents, acids/alkalis, cleaning fluids	petroleum distillates, aromatic hydrocarbons, mineral spirits, benzene, toluene, petroleum naphtha	ignitable wastes, spent solvents, combustible solids, waste acid/alkaline solutions
Rust removal	naval jelly, strong acids, strong alkalies	phosphoric acid, hydrochloric acid, hydrofluoric acid, sodium hydroxide	waste acids, waste alkalies
Paint preparation	paint thinners, enamel reducers, white spirits	alcohols, petroleum distillates, oxygenated solvents, mineral spirits, ketones	spent solvents, ignitable wastes, ignitable paint wastes, paint wastes with heavy metals
Painting	enamels, lacquers, epoxies, alkyls, acrylics, primers	acetone, toluene, petroleum distillates, epoxy ester resins, methylene chloride, xylene, VM&P naphtha, aromatic hydrocarbons, methyl isobutyl, ketones	ignitable paint wastes, spent solvents, paint wastes with heavy metals, ignitable wastes
Spray booth, spray guns, and brush cleaning	paint thinners, enamel reducers, solvents, white spirits	ketones, alcohols, toluene, acetone, isopropyl alcohol, petroleum distillates, mineral spirits	ignitable paint wastes, heavy metal paint wastes, spent solvents
Paint removal	solvents, paint thinners, enamel reducers, white spirits	acetone, toluene, petroleum distillates, methanol, methylene chloride, isopropyl alcohol, mineral spirits, alcohols, ketones, other oxygenated solvents	ignitable paint wastes, heavy metal paint wastes, spent solvents
Used lead acid batteries	car, truck, boat, motorcycle, and other vehicle batteries	lead dross, less than 3% free acid	used lead acid batteries, strong acid/alkaline solutions

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Table 3

WASTE DESCRIPTIONS*				
WASTE TYPE	DESIGNATIONS/ TRADE NAMES	DOT SHIPPING NAME	HAZARD CLASS	UN/NA ID NUMBER
STRONG ACID/ALKALINE WASTES				
Ammonium Hydroxide	Ammonium Hydroxide, NH ₄ OH, Spurge of Hartmann, Aqua Ammonia	Waste Ammonium Hydroxide (containing not less than 12% but not more than 34% ammonia)	Corrosive Material	NA2672
		(containing less than 12% ammonia)	ORM-A	NA2672
Hydrobromic Acid	Hydrobromic Acid, HBr	Waste Hydrobromic Acid (not more than 49% strength)	Corrosive Material	UN1788
Hydrochloric Acid	Hydrochloric Acid, HCl, Muriatic Acid	Waste Hydrochloric Acid	Corrosive Material	NA1789
Hydrofluoric Acid	Hydrofluoric Acid, HF, Fluomuriatic Acid	Waste Hydrofluoric Acid	Corrosive Material	UN1790
Nitric Acid	Nitric Acid, HNO ₃ , Aquafortis	Waste Nitric Acid (over 40%) (40% or less)	Oxidizer Corrosive Material	UN2031 NA1790
Phosphoric Acid	Phosphoric Acid, H ₃ PO ₄ , Orthophosphoric acid	Waste Phosphoric Acid	Corrosive Material	UN1805
Potassium Hydroxide	Potassium Hydroxide, KOH, Potassium Hydroxide, Caustic Potash, Potassa	Waste Potassium Hydroxide Solution	Corrosive Material	UN1814
		Dry Solid, Flake, Bead, or Granular	Corrosive Material	UN1813
Sodium Hydroxide	Sodium Hydroxide, NaOH, Caustic Soda, Soda Lye, Sodium Hydroxide	Waste Sodium Hydroxide Solution	Corrosive Material	UN1824
		Dry Solid, Flake, Bead, or Granular	Corrosive Material	UN1823
Sulfuric Acid	Sulfuric Acid, H ₂ SO ₄ , Oil of Vitriol	Waste Sulfuric Acid	Corrosive Material	UN1830
Chromic Acid	Chromic Acid	Waste Chromic Acid Solution	Corrosive Material	UN1753
IGNITABLE WASTES				
Ignitable Wastes NOS [†]	Carbonator Cleaners, Ignitable Wastes NOS	Waste Flammable Liquid NOS	Flammable Liquid [‡]	UN1993
Aromatic Hydrocarbons		Waste Combustible Liquid NOS	Combustible Liquid [‡]	NA1993
Petroleum Distillates		Waste Flammable Solid NOS	Flammable Solid	UN1325
IGNITABLE PAINT WASTES				
Ethylene Dichloride	Ethylene Dichloride, 1,2-Dichloroethane	Waste Ethylene Dichloride	Flammable Liquid	UN1184
Benzene	Benzene	Waste Benzene (benzol)	Flammable Liquid	UN1114
Toluene	Toluene	Waste Toluene (toluol)	Flammable Liquid	UN1294
Ethyl benzene	Ethyl benzene	Waste Ethyl benzene	Flammable Liquid	UN1175
Chlorobenzene	Chlorobenzene, Monochlorobenzene, Phenylchloride	Waste Chlorobenzene	Flammable Liquid	UN1134
Methyl Ethyl Ketone	Methyl Ethyl Ketone, MEK, Methyl Acetone, Mavesco, Butanone, Ethyl Methyl Ketone	Waste Methyl Ethyl Ketone	Flammable Liquid	UN1193
SPENT SOLVENTS				
White Spirits, Varnish	White Spirits, Mineral Spirits, Naphtha	Waste Naphtha	Flammable Liquid Combustible Liquid	UN2553 UN2553
1,1,1-Trichloroethane	Aerohane TT, Chloron, Chlorosolene, Methyl- Chloroform, Alpha T, Chlorosene	Waste 1,1,1-Trichloroethane	ORM-A	UN2831
Petroleum distillates	Petroleum Distillates	Petroleum Distillate	Flammable Liquid Combustible Liquid	UN1268 UN1268
PAINT WASTES WITH HEAVY METALS				
Paints with heavy metals Lead Nickel Chromium	Heavy Metals Paint	Hazardous Waste, Liquid or Solid, NOS	ORM-E	NA9189

*These descriptions may change from variations in waste characteristics or conditions.

†NOS — Not otherwise specified.

‡A flammable liquid has a flash point below 100°F.

§A combustible liquid has a flash point between 100°F and 200°F.

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